

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (previously presented): A process for producing a wear-resistant, tribological cylinder bearing surface for a piston running in a cylinder of a crankcase of an internal-combustion engine, the process which comprises:

positioning a laser such that a longitudinal axis of the laser is substantially coaxial to a cylinder of a crankcase of an internal-combustion engine;

rotating the laser about the longitudinal axis of the laser and simultaneously advancing the laser in a direction of the longitudinal axis of the laser;

feeding a powdery material through the laser and directing a jet of the powdery material to a cylinder bearing surface of the cylinder;

deflecting a laser beam to an impact region where the jet of the powdery material impinges on the cylinder bearing surface and guiding the jet of the powdery material such that at least

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

part of the jet of the powdery material passes through the laser beam;

at least partially melting, with the laser beam, a surface of the impact region such that the surface of the impact region is at least partially melted before the powdery material impinges on the surface of the impact region; and

forming given structures in the cylinder bearing surface by using an additional laser treatment.

Claim 2 (canceled).

Claim 3 (previously presented): The process according to claim 1, which comprises forming oil pockets in the cylinder bearing surface by using the additional laser treatment.

Claim 4 (original): The process according to claim 1, which comprises using, as the powdery material, at least one material selected from the group consisting of a silicon-containing material, a tungsten-containing material and a nickel-containing material.

Claim 5 (original): The process according to claim 1, which comprises adjusting a laser energy such that the powdery

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

material, which passes through the laser beam and is transported in the jet, is deposited on the cylinder bearing surface.

Claim 6 (original): The process according to claim 1, which comprises adjusting a laser energy such that the powdery material, which passes through the laser beam and is transported in the jet, is alloyed into the cylinder bearing surface.

Claim 7 (original): The process according to claim 1, which comprises adjusting a laser energy such that the powdery material, which passes through the laser beam and is transported in the jet, is alloyed into the cylinder bearing surface and is deposited on the cylinder surface.

Claim 8 (original): The process according to claim 1, which comprises selecting a given rotational speed for the step of rotating the laser about the longitudinal axis of the laser, selecting a given translational speed for the step of advancing the laser in the direction of the longitudinal axis of the laser and selecting a given laser energy such that the powdery material is deposited with a layer thickness of substantially 800  $\mu\text{m}$  to 1000  $\mu\text{m}$ .

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

Claim 9 (original): The process according to claim 1, which comprises selecting a given rotational speed for the step of rotating the laser about the longitudinal axis of the laser, selecting a given translational speed for the step of advancing the laser in the direction of the longitudinal axis of the laser and selecting a given laser energy such that the powdery material is alloyed into the cylinder bearing surface with a penetration depth of substantially 250  $\mu\text{m}$  and such that at the same time the powdery material is deposited with a layer thickness of substantially 250  $\mu\text{m}$ .

Claim 10 (original): The process according to claim 1, which comprises operating the laser with a laser energy of substantially 2 kW.

Claim 11 (original): The process according to claim 1, which comprises advancing the laser such that the laser passes only once through the cylinder for performing operating steps.

Claim 12 (original): The process according to claim 1, which comprises advancing the laser such that the laser passes several times through the cylinder for performing operating steps.

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

Claim 13 (currently amended): A device for producing a wear-resistant, tribological cylinder bearing surface in a cylinder of a crankcase of an internal-combustion engine, comprising:

a laser for providing a laser beam;

said laser having a longitudinal axis and being positioned such that the longitudinal axis of said laser is substantially coaxial to a cylinder of a crankcase of an internal-combustion engine;

said laser rotating about the longitudinal axis and simultaneously advancing in a direction of the longitudinal axis;

a powder feed device extending through said laser;

said powder feed device being configured to guide a jet of a powdery material through the laser beam and to guide the jet of the powdery material to an impact region on a cylinder bearing surface where the powdery material impinges on the cylinder bearing surface;

a beam-deflecting device operatively connected to said laser, said beam-deflecting device deflecting the laser beam onto the

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

impact region where the powdery material impinges on the  
cylinder bearing surface; and

said laser being configured to provide an additional laser  
treatment for forming given structures in the cylinder bearing  
surface.

Claim 14 (original): The device according to claim 13,  
wherein said beam-deflecting device includes at least one  
optical device selected from the group consisting of a mirror,  
a lens system and optical fibers.

Claim 15 (currently amended): In combination with a crankcase  
having a cylinder, a device for producing a wear-resistant,  
tribological cylinder bearing surface in the cylinder,  
comprising:

a laser for providing a laser beam, said laser having a  
longitudinal axis and being positioned such that the  
longitudinal axis of said laser is substantially coaxial with  
respect to the cylinder;

said laser rotating about the longitudinal axis and  
simultaneously advancing in a direction of the longitudinal  
axis;

Appl. No. 09/933,053

Amndt. dated June 23, 2004

Reply to Notice of Non-Compliant Amendment of June 17, 2004

a powder feed device extending through said laser;

said powder feed device being configured to guide a jet of a powdery material through the laser beam and to guide the jet of the powdery material to an impact region on a cylinder bearing surface where the powdery material impinges on the cylinder bearing surface;

a beam-deflecting device operatively connected to said laser, said beam-deflecting device deflecting the laser beam onto the impact region where the powdery material impinges on the cylinder bearing surface; and

said laser being configured to provide an additional laser treatment for forming given structures in the cylinder bearing surface.

Claim 16 (original). The device according to claim 15, wherein said beam-deflecting device includes at least one optical device selected from the group consisting of a mirror, a lens system and optical fibers.